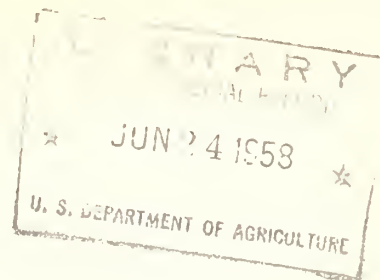


Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

g 847mw
op. 3



EFFECTS OF LINT CLEANING OF Cotton

An economic analysis at California gins

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service
Marketing Research Division

MARKETING RESEARCH REPORT No. 238

CONTENTS

	Page
Summary.....	v
Objective of the study.....	2
Scope and method of the study.....	2
Selection of the area.....	2
Characteristics of the selected gins.....	3
Method of study.....	4
Controlled-bat saw-type lint cleaners.....	6
Effect on staple length.....	6
Analysis of lint cleaner waste.....	7
Effect on grade and bale value.....	9
Effect on fiber properties and processing performance.....	9
Flow-through saw-type lint cleaners.....	13
Effect on staple length.....	14
Analysis of lint cleaner waste.....	14
Effect on grade and bale value.....	14
Effect on fiber properties and processing performance.....	18
Air-beater-centrifugal type lint cleaners.....	19
Effect on staple length.....	20
Analysis of lint cleaner waste.....	21
Effect on grade and bale value.....	21
Effect on fiber properties and processing performance.....	25
Air-centrifugal type lint cleaners.....	26
Effect on staple length.....	27
Analysis of lint cleaner waste.....	27
Effect on grade and bale value.....	29
Effect on fiber properties and processing performance.....	32
Some problems associated with use of lint cleaners.....	33
Need for selective use.....	33
Relation between cotton grading and lint cleaning.....	34
Effect of lint cleaning on fiber properties.....	36

ACKNOWLEDGMENTS

The cooperation of ginnerers in the San Joaquin Valley of California in furnishing samples of cotton and data made this study possible. The cotton was classified by classifiers of the Cotton Division, Agricultural Marketing Service.

Washington, D. C.

May 1958

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price 25 cents

SUMMARY

This study was undertaken to determine the effect of the lint cleaning of machine-picked cotton upon grade, bale value, and returns to farmers.

The San Joaquin Valley of California was selected as the logical site for the study because it is a highly concentrated cotton-producing area, most of the cotton crop is harvested by machine pickers, and almost all of the cotton grown in that area is passed through lint cleaners at gins.

Routine use of any of the four types of lint cleaners studied resulted, on the average for all bales, in reductions in average bale value when weight losses from lint cleaning were taken into account. The average amounts of such reductions for bales of machine-picked cotton sampled during the 1954-55 and the 1955-56 seasons were as follows:

Type of lint cleaner	Average reduction in bale value following lint cleaning
Controlled-bat saw-type....	\$1.40
Flow-through saw type.....	.76
Air-beater-centrifugal....	.38
Air-centrifugal.....	1.06

Charges made by gins for the lint cleaning service would have to be added to the above reductions to obtain the total cost to the farmer. Such charges averaged about \$1.60 per bale on bales sampled in connection with this study.

Lint cleaning the higher grades of cotton usually resulted in losses in bale value, while lint cleaning the lower grades frequently brought gains. As noted above, losses outweighed gains on each group of gin-run bales sampled. For grades Low Middling and below, net gains frequently resulted even after payment of the service charge, but results were not sufficiently consistent to make such gains a certainty. Only a few bales of Spotted and Gray cottons were sampled. On the basis of these samples, the prospect for net profits to producers from lint cleaning such cottons was discouraging.

Price differentials for grade were unusually small during the study seasons. In years when spreads among premiums and discounts for the various grades are wider, lint cleaning should be more profitable.

Saw-type lint cleaners were more effective in improving the grade of cotton than air-type lint cleaners, but they also removed more weight from the bale. The controlled-bat saw-type cleaners were particularly effective in improving the selling price; the increase was 0.8 cents per pound (\$4 per bale), on the average, but this gain was cancelled out by the reduction of bale weights by 16-1/2 pounds per bale.

Lint cleaning had no measurable effect upon staple length and no consistent effect upon the measured fiber properties or processing performance, except for a reduction of 1 to 3 percentage points in laboratory picker and card waste. The excess laboratory picker and card waste removed from the control (non-lint-cleaned) bales corresponded rather closely, in most cases, to the waste removed by the lint cleaners.

There were marked differences in the composition of lint cleaner waste removed by the four types of cleaners. Waste from both air types of cleaners contained over 87 percent actual trash and less than 13 percent lint. For the controlled-bat saw-type cleaners, the ratio of trash to lint was about 70-30, and for the flow-through saw-type cleaners, the ratio was lowest, about 60-40.

Lint cleaning has been accepted widely by cotton growers and ginnermen as a way to increase bale values, but it also has created problems. One pertains to the frequency of use of the cleaners. Once a lint cleaner has been installed in a gin, both ginnermen and growers prefer to use it on all bales ginned because that procedure simplifies gin operation and because the removal of trash from cotton increases its value per pound. Economic studies have indicated, however, that to be profitable, lint cleaners must be used selectively. Cleaning high-grade cotton usually reduces bale value, because losses in weight more than offset gains in price per pound.

Another factor which must be taken into consideration in deciding when to use lint cleaners is the spread among price differentials for the various grades. Premiums and discounts for grade have halved and then doubled since the introduction of lint cleaners about 10 years ago, and profits or losses from lint cleaning have varied accordingly.

A second but closely associated problem relates to grading. Lint cleaning tends to distort the traditional relationships between the trash content and the color of cotton. As more and more trash is removed from the bale, the color of the lint may look unnatural to the cotton classifier. Consequently, relatively more emphasis may be given to color than to trash when a grade is assigned to the cotton.

Finally, the reaction of textile mill management to lint cleaning has been unfavorable. Mill men buy the cotton and prefer its higher grades, but they state that excessive machining at the gin decreases fiber length uniformity, and that it breaks up the remaining trash into small particles which become compacted with the fiber. They claim that, as a result, processing costs at the mill are increased and product quality is lowered. Research on this question and on ways to identify gin damage in marketing channels is under way.

EFFECTS OF LINT CLEANING OF COTTON
An Economic Analysis at California Gins

By James S. St. Clair 1/ and Arthur L. Roberts,
agricultural economists

No new item of equipment has been adopted as readily by ginners as the lint cleaner. Only 28 gins operated lint cleaners during the 1948-49 season, but in 1950-51, the number had increased to about 500. 2/ By 1954-55, approximately 2,275 gins, or about 32 percent of the total, were so equipped. 3/ During this same period, there was a rapid increase in the proportion of the upland cotton crop harvested by machine pickers, from 1.5 percent in 1948-49 to 15.9 percent in 1954-55.

Lint cleaning equipment for gins was developed to supplement seed cotton cleaning equipment by removing additional leaf and other trash particles, especially those characteristic of machine-picked cotton. As the demand for this service increased, several types and designs of lint cleaners became available.

An immediate question was raised about lint cleaners: When and how much do growers benefit from their use? Several factors were involved, including the condition of the lint prior to lint cleaning, the extent of grade improvements, bale weight losses associated with grade improvements, the price level for cotton, and the premiums and discounts prevailing for the different grades. Studies in widely separated areas in 1949-50 and 1950-51 indicated that, on the average, growers benefited from lint cleaning, except where cotton was running Middling White or better without lint cleaning. 4/

1/ Dr. St. Clair left the U. S. Department of Agriculture to join the staff of the University of Wyoming in August 1957.

2/ Gerdes, Frances L., Cotton Lint Cleaning at Gins--An Evaluation from the Standpoint of Cotton Quality and Economic Factors, U. S. Dept. Agr., May 1951 (proc.)

3/ Fortenberry, A. J., Charges for Ginning Cotton, Seasons 1947-48 to 1954-55, Mktg. Res. Rept. No. 120, U. S. Dept. Agr., June 1956.

4/ See Anderson, Robert F., Smith, Harvin R., and Looney, Zolon M., An Evaluation of the Costs and Quality of Ginning in the Piedmont Area of Georgia, Seasons of 1950-51 and 1951-52, Ga. Agr. Expt. Sta. Bul. 280, April 1953; Fortenberry, William H. and Looney, Zolon M., Cotton Ginning Efficiency and Costs in the Rio Grande and Pecos Valleys, Seasons of 1949-50 and 1950-51, Prod. and Mktg. Admin., U. S. Dept. of Agri., October 1952; and Stedronsky, Victor L. and Shaw, Charles S., The Flow-Through Lint-Cotton Cleaner, U. S. Dept. of Agri., Circ. 858, November 1950.

Further studies indicated fewer overall benefits, with net losses usually occurring where cotton was Strict Low Middling White or better in grade before lint cleaning. This change in results apparently was caused in part by narrower spreads among price differentials for grades in the later seasons. 5/

In spite of published evidence that lint cleaners paid off only with selective use, information from most parts of the Cotton Belt indicated that many ginners were lint cleaning all or most bales. In numerous cases, growers were requesting that all bales be passed through such cleaners regardless of method and time of harvest. In other instances, ginners apparently found the off-and-on use of lint cleaners too bothersome. Tabulations made at the close of the 1954-55 season confirmed that fact. During that season, approximately 94 percent of all cotton originating from gins with lint cleaners was lint cleaned. Strong evidence continued to pile up that further study in this field might provide a sound opportunity for financial savings to farmers.

OBJECTIVES OF THE STUDY

This study was undertaken to determine the effects of the lint cleaning of machine-picked cotton upon grade, bale value, and returns to farmers in a selected cotton-growing area containing a concentration of lint cleaners along with large-scale employment of spindle-type machine pickers in harvesting the crop.

SCOPE AND METHOD OF THE STUDY

Selection of the Area

The San Joaquin Valley of California was selected as the logical site for the study. California in recent years has advanced to third or fourth in volume of production among the cotton-growing States, and practically all of its cotton is grown in the fertile San Joaquin Valley. Annual production varies from 1-1/4 to 1-3/4 million bales of cotton, usually valued at more than \$250,000,000.

The climate is dry and the growing season is exceptionally long. All of the crop is irrigated, a practice made feasible by the level terrain and the deep, rich soils. Acala 4-42 is the only variety of cotton grown in this one-variety State; laws prohibit the planting of other varieties for commercial purposes. Yields are very high, averaging from 800 to 900 pounds of lint per acre.

5/ See Cable, C. Curtis, Jr., and Looney, Zolon M., Effects and Costs of Cleaning Lint in Arkansas Cotton Gins, Arkansas Agr. Expt. Sta., Bul. 595, December 1957; Ross, John E., Jr., and Looney, Zolon M., Some Economic Considerations of Using Lint Cleaners in Western Oklahoma, Agr. Mktg. Ser., U. S. Dept. Agr. (paper presented at the annual meeting of the Oklahoma Cotton Ginners Assn., Oklahoma City, Okla., March 2-3, 1954); and St. Clair, James S., and Roberts, Arthur L., Quality and Cost of Ginning Upland Cotton in Arizona, Arizona Agr. Expt. Sta. Bul. 277, September 1956.

Cotton production is a large-scale operation in California. More than one-fourth of the cotton farms grow 100 acres or more, and both the cultivation and the harvesting of the crop are highly mechanized. Machine pickers are used there to the greatest extent in the entire Cotton Belt. In 1954-55, 62 percent of the cotton crop was picked by machine.

Gins in this important valley are modern in design and equipment. Most of them have lint cleaners, and a number are equipped to sample bales of cotton automatically, and to compress bales to standard or high density. Approximately 96 percent of California gins had lint cleaners in 1954-55, and about 92 percent of all cotton ginned in California during that season was passed through lint cleaners. 6/

Characteristics of the Selected Gins

Eight gins were included in the study, selected so that each of the four types of lint cleaners then in commercial operation was represented by two gins. These lint cleaners were, by type:

- (1) Saw, controlled-bat
- (2) Saw, flow-through
- (3) Air-beater-centrifugal
- (4) Air-centrifugal

All eight gins were large, relatively new plants, elaborately equipped for seed cotton cleaning and conditioning. Total investment for plant and equipment, including lint cleaners, averaged about \$210,000.

These gins were similar, except for the types of lint cleaners in use. Since it was not possible to find eight gins with identical gin machinery and equipment, checks were made to determine if there were significant differences among gin groups in cotton received, or in the effectiveness of equipment utilized before lint cleaning. Seed cotton samples were taken both from the trailer and from the feeder slide during the ginning of each bale studied. These samples were analyzed in the laboratory to determine moisture and foreign matter content of the cotton as it came to the gin and as it entered the gin stands (tables 1 and 2). No significant differences were found among gin groups in the condition of seed cotton as received at the gins nor in the pre-cleaning and conditioning of the cotton.

6/ Fortenberry, A. J., op. cit.

Table 1.--Moisture: Seed cotton content, amount removed from seed cotton, and lint content, machine-picked cotton, by lint cleaning equipment group, San Joaquin Valley, California, crop years 1954 and 1955

Item	Type of lint cleaning equipment				Average
	Con-	Flow-	Air-	Air-	
	trolled	through	beater-	centrif-	
	-bat	saw-type	centrif-	ugal	
	saw-type		ugal		
	Percent	Percent	Percent	Percent	Percent
Seed cotton:					
On trailer as received at gin..	11.6	11.8	13.2	11.7	12.1
At gin stand, after drying.....	8.5	8.5	9.8	8.5	8.8
Proportion moisture removed....	27	28	26	27	27
Lint moisture content.....	4.1	4.2	4.0	4.2	4.1

Table 2.--Foreign matter: Seed cotton content, amount removed from seed cotton, machine-picked cotton, by lint cleaning equipment group, San Joaquin Valley, California, crop years 1954 and 1955

Item	Type of lint cleaning equipment				Average
	Con-	Flow-	Air-	Air-	
	trolled	through	beater-	centrif-	
	-bat	saw-type	centrif-	ugal	
	saw-type	saw-type	ugal	ugal	
	Percent	Percent	Percent	Percent	Percent
On trailer as received at gin....	10.0	8.3	6.8	8.9	8.5
At gin stand after cleaning.....	2.0	1.1	1.3	1.2	1.4
Proportion foreign matter removed:	80	87	81	87	84

Method of Study

The work plan involved sampling a continuous run of 36 bales at each gin in midseason and 36 bales in the late season during each of the 2 ginning seasons, 1954-55 and 1955-56. Originally it was planned to assemble data on both hand- and machine-picked cotton for comparative purposes. Scarcity of hand-harvested cotton, however, at the time of visits to gins, made it necessary to restrict the analysis to machine-picked cotton. Rainy weather during the first season reduced the volume of cotton available for sampling during visits to gins. A total of 387 bales were sampled in 1954-55 and 502 bales in 1955-56 (table 3).

Table 3.--Bales of cotton sampled: Machine-picked cotton, by lint cleaning equipment group, San Joaquin Valley, California, crop years 1954 and 1955

Crop year and season	Type of lint cleaning equipment				Total
	Controlled-bat	Flow-through	Air-beater-	Air-	
	saw-type	saw-type	centrifugal	centrifugal	
	<u>Number</u>	<u>Number</u>	<u>Number</u>	<u>Number</u>	<u>Number</u>
1954:					
Midseason.....	62	49	51	34	196
Late season...	67	33	32	59	191
Total.....	129	82	83	93	387
1955:					
Midseason.....	67	54	72	72	265
Late season...	66	38	69	64	237
Total.....	133	92	141	136	502
Total.....	262	174	224	229	889

To appraise the performance of the lint cleaners, a sample of lint was taken from each bale before it passed through the lint cleaners and a second sample was taken after it passed through. Paired samples were classed promptly by the Government classing office regularly serving the gin in question. Results of this classing made it possible to observe for each bale the amount of change in grade and staple that had taken place as a result of lint cleaning.

The lint cleaner waste from each bale was caught and weighed to determine the reduction in bale weight resulting from lint cleaning. A portion of the waste sample from every third bale was analyzed by the Shirley Analyzer to determine the proportions of lint and trash in the waste samples.

Fiber and spinning tests were made on composite lint samples representing "before cleaning" and "after cleaning" samples of the predominant grades and staples from each gin in both ginning periods in each season.

Bale values before and after lint cleaning were computed from the seasonal average price of a pound of cotton of each of the grades in question, after adjustment for weight loss for the bales passed through a lint cleaner. Price differentials for the various grades of cotton in the Fresno area changed considerably from 1954-55 to 1955-56 (table 4). The greater discounts for low-grade cotton during the latter season gave growers more incentive to have their cotton lint cleaned during that year than in 1954-55. In terms of bale value, however, the potential advantages offered by relatively large premiums for higher grades were largely offset by the improved grade of the crop in 1955-56.

Table 4.--Price quotations: Specified qualities of 1-1/16-inch staple length cotton, Fresno, Calif., crop years 1954 and 1955 1/

Grade	Price per pound		Premiums and discounts from Middling 1-1/16-inch	
	1954-55	1955-56	1954-55	1955-56
	Cents	Cents	Points	Points
Strict Middling.....	36.04	36.62	45	96
Middling.....	35.59	35.66	0	0
Strict Low Middling.....	34.36	33.90	-123	-176
Low Middling.....	32.72	31.18	-287	-448
Strict Good Ordinary.....	29.91	28.28	-568	-738
Good Ordinary.....	27.93	26.02	-766	-964

1/ Cotton Price Statistics, AMS, U. S. Department of Agriculture.

CONTROLLED-BAT SAW-TYPE LINT CLEANERS

The controlled-bat saw-type lint cleaner gets its name from the fact that the lint passes between rollers after leaving the lint cleaner condenser, and thus reaches the lint cleaner saws in the form of a bat (fig. 1). The trash is expelled between the five grid bars which are placed in the path of the rotating saws. The lint is doffed from the saws by a brush cylinder located at the rear of the saws, and thence passes into the lint flue.

The base price f.o.b. factory of these lint cleaners with necessary accessories for a 5 - 90 gin plant (a plant with 5 gin stands and 90 saws in each stand) was approximately \$15,000 in 1956. That sum included the lint cleaners, condensers, bypass valves, trash conveyor, driving attachments, shafting, couplings, floor stands, flat belt main drive, and so forth, but it did not include the electric motor or lint flue. Freight to California on 28,000 pounds at \$3.50 per hundredweight would add \$980 to this figure and installation at 7 percent of f.o.b. price would add another \$1,050. This would bring the total cost of this type of cleaner, installed in a 5 - 90 gin plant in the San Joaquin Valley, to a little more than \$17,000, or about 8-1/2 percent of the total cost of the fully equipped gin.

Effect of Controlled-Bat Saw-Type Lint Cleaners on Staple Length

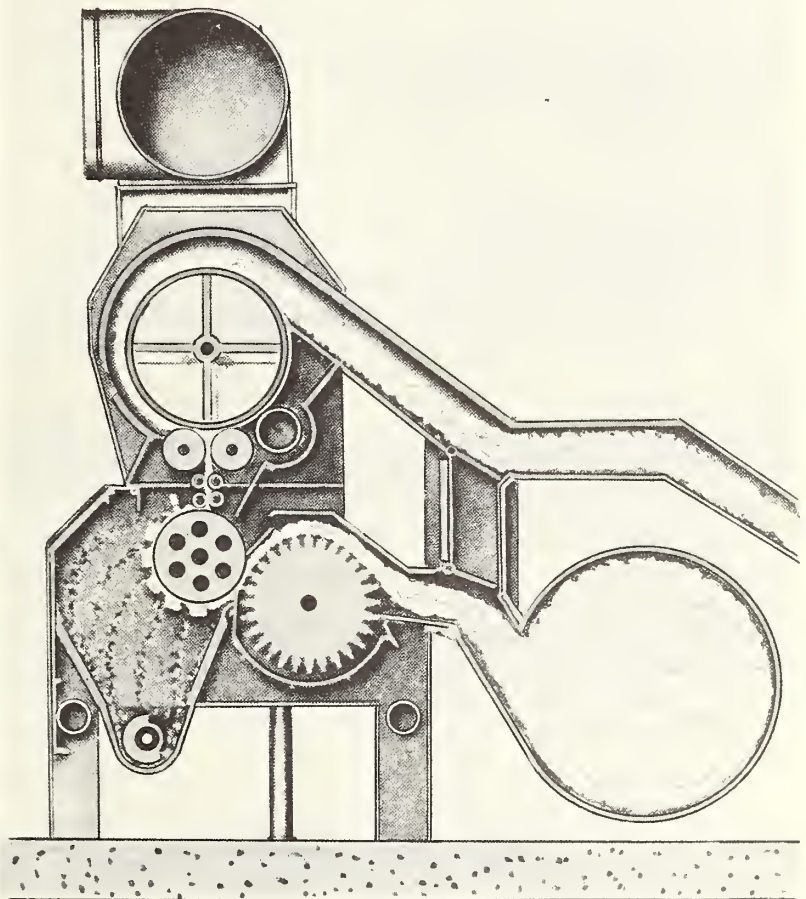
For all four types of lint cleaners, the effect of lint cleaning on staple length was so small as to be unimportant from a market standpoint. The average staple length of cotton passed through controlled-bat saw-type lint cleaners during the 1954 crop year was 33.7 thirty-seconds of an inch both before and after lint cleaning. During the 1955 crop year, average staple lengths were

34.2 and 34.5 thirty-seconds of an inch, respectively, before and after lint cleaning. However, the increase in average length during the latter season may have reflected random classing variations rather than a real increase in fiber length. As is shown later, the Fibrograph did not confirm an increase in fiber length after lint cleaning.

Analysis of Lint Cleaner Waste Removed by
Controlled-Bat Saw-Type Lint Cleaners

Controlled-bat saw-type lint cleaners removed an average of nearly 18 pounds of waste material per bale during the 1954 season. The average composition of this material was approximately 29 percent lint and 71 percent trash. During the 1955 season, these cleaners removed over 15 pounds total waste per bale, consisting of 31 percent lint and 69 percent trash (table 5).

The amount of waste removed and its makeup vary with the grade of cotton being cleaned. For example, in the 1955 season, the lint cleaning of Middling cotton resulted in removal of less than 10 pounds of waste, of which 42 percent was lint. On the other hand, the lint cleaning of Good Ordinary cotton resulted in the removal of more than 31 pounds of waste containing only 24 percent lint.



BN-5570

Figure 1.--Cross-sectional view of controlled-bat saw-type lint cleaner.

Table 5.--Lint cleaner waste: Amount and kind removed from machine-picked cotton, controlled-bat saw-type lint cleaners, San Joaquin Valley, California, crop years 1954 and 1955

Grade before lint cleaning	Total lint cleaner waste 1/	Waste analysis 2/			
		Lint content		Trash content	
	Pounds	Pounds	Percent	Pounds	Percent
1954:					
White cotton:					
Middling.....	16.0	5.3	33	10.7	67
Strict Low Middling Plus..	14.9	5.1	34	9.8	66
Strict Low Middling.....	15.2	5.6	37	9.6	63
Low Middling Plus.....	11.4	3.8	33	7.6	67
Low Middling.....	16.3	4.8	29	11.5	71
Strict Good Ordinary.....	18.8	4.8	25	14.0	75
Good Ordinary Plus.....	23.2	5.3	23	17.9	77
Good Ordinary.....	20.8	5.0	24	15.8	76
Below Grade.....	28.3	4.8	17	23.5	83
Gray cotton:					
Middling Light Gray.....	7.9	2.5	31	5.4	69
All grades.....	17.7	5.2	29	12.5	71
1955:					
White cotton:					
Middling.....	9.6	4.0	42	5.6	58
Strict Low Middling Plus..	10.5	3.9	38	6.6	62
Strict Low Middling.....	9.6	2.9	30	6.7	70
Low Middling Plus.....	17.8	5.8	33	12.0	67
Low Middling.....	19.2	4.6	24	14.6	76
Strict Good Ordinary Plus:	21.3	5.4	25	15.9	75
Strict Good Ordinary.....	25.0	4.9	20	20.1	80
Good Ordinary.....	31.4	7.4	24	24.0	76
All grades.....	15.3	4.7	31	10.6	69

1/ Per 500-pound gross weight bale.

2/ As determined by Shirley Analyzer test.

Effect of Controlled-Bat Saw-Type Lint Cleaners on
Grade and Bale Value

Controlled-bat saw-type lint cleaners raised the grade of machine-picked cotton by an amount sufficient to increase the average selling price from 31.68 to 32.57 cents per pound, or by 89 points, in 1954 and from 32.65 to 33.33 cents per pound, or by 68 points, in 1955 (tables 6 and 7).

However, this improvement in grade was accomplished at the expense of an average reduction in bale weight from 500 to 482.3 pounds, or a decrease of 17.7 pounds, in 1954, and from 500 to 484.7 pounds, or a decrease of 15.3 pounds, in 1955.

When grade improvement and weight loss are both considered, the net result is an average loss in bale value of \$1.25 per bale in 1954 and \$1.55 per bale in 1955. The effect of controlled-bat saw-type lint cleaning upon different grades of cotton varied widely. For example, during the 1954 season, the lint cleaning of Middling cotton resulted in a loss of \$7.73 per bale while lint cleaning Below Grade cotton resulted in a gain of \$7.10 per bale.

In general, it appears that there is a better chance of making an economic gain in lint cleaning the lower grades than the higher grades, although results in this regard are far from consistent. The grades of Low Middling Plus, Strict Good Ordinary, Good Ordinary Plus, Good Ordinary, and Below Grade showed gains in bale value from controlled-bat saw-type lint cleaning during the 1954-55 season, while the grades of Middling, Strict Low Middling Plus, Strict Low Middling, Low Middling, and Middling Light Gray showed economic losses from lint cleaning.

In 1955, although price differentials for grade were greater, only Strict Low Middling Plus and Strict Good Ordinary showed increases in bale value through controlled-bat saw-type lint cleaning, while Middling, Strict Low Middling, Low Middling Plus, Low Middling, Strict Good Ordinary Plus, and Good Ordinary all showed losses.

In making his analysis, the farmer would also have to take into account the gin charge for the lint cleaning service. This was usually assessed at 10 cents per hundredweight of seed cotton. For the bales sampled, this would have averaged about \$1.70 per bale in 1954 and \$1.63 per bale in 1955.

Effect of Controlled-Bat Saw-Type Lint
cleaning on Fiber Properties and Processing Performance

Controlled-bat saw-type lint cleaners had no appreciable effect on fiber length and fiber length distribution as measured by the classer and the Fibrograph (table 8). Nor was the quality of the yarn spun in the laboratory from cotton passed through the lint cleaner significantly different from that spun from cotton not passed through the lint cleaner.

Table 6.--Grade, bale weight, and bale value: Machine-picked cotton before and after lint cleaning, controlled-bat saw-type lint cleaners, San Joaquin Valley California, crop of 1954

Grade before Lint cleaning	Grade after lint cleaning										Fresno price		Weight of		Bale value		Gain or	
	Total	M	SLM+	SLM	LM+	LM	SGO+	SGO	GO+	GO	BG	SM	M	SLM	SLM	Lint	After	loss
												lt G	lt G	lt G	lt G	cleaning	cleaning	value
	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Cents	Pounds	Dollars
White grades																		
Middling.....	8	6		1												35.59	184.0	177.95
Strict Low Middling Plus....	20	10	4	5								1				34.77	185.1	173.85
Strict Low Middling.....	16	1	3	7								3	2			34.36	184.8	171.80
Low Middling Plus.....	9	1	3	5												33.27	188.6	166.35
Low Middling.....	20	2	1	5		5						2	2	3		32.72	183.7	163.60
Strict Good Ordinary Plus	-															30.85	-	-
Strict Good Ordinary.....	23		3		5		1	9	1					3	1	29.91	181.2	149.55
Good Ordinary Plus.....	7						4	2	1							28.59	176.8	142.95
Good Ordinary.....	17						1	9	6					1		27.93	179.2	139.65
Below Grade.....	8						2	2	1	2	1					25.93	171.7	129.65
Gray grades																		
Strict Middling Light Gray..	-															33.44	-	-
Middling Light Gray.....	1				1											32.83	192.1	161.15
Strict Low Middling	-															31.35	-	-
Light Gray.....	-															30.38	-	-
Strict Low Middling Gray....	-															-	-	-
All bales.....	129	20	11	26	-	11	8	22	3	8	1	6	5	6	2	31.68	182.3	158.41

1/ Based on season average price quotations for 1-1/16 inch staple length cotton; prices estimated for "plus" grades, Light Gray, and Below Grade cotton.

Table 7.--Grade, bale weight, and bale value: Machine-picked cotton before and after lint cleaning, controlled-bat saw-type lint cleaners, San Joaquin Valley, California crop of 1955

Grade before Lint cleaning	Grade after lint cleaning															Fresno price per pound l/		Weight of 500-pound		Bale value		Gain or loss	
	White grades															Gray grades:		Before		After		in	
	Total	SM	M+	M	SLM+	SLM	LM+	LM	SGO+	SGO	GO	SM	SLM	LM	SGO	GO	Before	After	Before	After	in	in	
	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Cents	Cents	Pounds	Dollars	Dollars	Dollars	
White grades																							
Strict Middling.....	-																36.62	-	-	-	-	-	
Middling Plus.....	-																35.98	-	-	-	-	-	
Middling.....	28	1	1	25	1												35.66	35.66	190.4	178.30	174.88	-3.42	
Strict Low Middling Plus.....	24			20	4												34.49	35.46	189.5	172.45	173.58	1.13	
Strict Low Middling.....	17			5	1	10					1						33.90	34.39	190.4	169.50	168.65	-.85	
Low Middling Plus.....	15				2	4	5	4									32.09	32.65	182.2	160.45	157.44	-3.01	
Low Middling.....	29				8	1	17		1								31.18	31.78	180.8	155.90	152.80	-3.10	
Strict Good Ordinary Plus.....	2					1			1								29.25	30.18	178.7	146.25	144.47	-1.78	
Strict Good Ordinary.....	12				1	2	4		4	1							28.28	30.16	175.0	141.40	143.26	1.86	
Good Ordinary.....	6								4	2							26.02	27.53	168.6	130.10	129.01	-1.09	
Gray grades																							
Strict Middling Light Gray.....	-																32.80	-	-	-	-	-	
Strict Low Middling Light Gray.....	-																30.06	-	-	-	-	-	
All bales.....	133	1	1	50	8	23	9	25	-	10	3	1	2				32.65	33.33	184.7	163.24	161.69	-1.55	

1/ Based on season average price quotations for 1-1/16 inch staple length cotton; prices estimated for "plus" grades and light Gray cotton.

Table 8.--Laboratory fiber and spinning test results: Machine-picked cotton before and after lint cleaning, controlled-bat saw-type lint cleaners, San Joaquin Valley, California, crop years 1954 and 1955

Test item	Unit	Midseason cotton		Late-season cotton	
		Before	After	Before	After
		lint	lint	lint	lint
		cleaning	cleaning	cleaning	cleaning
Raw cotton quality:					
Classification:					
Grade.....	1/ Index	96(SLM+)	97(SLM+)	80(SGO+)	82(LM)
Staple length.....	Inches	1-1/16	1-1/16	1-1/32	1-1/32
Fiber length (Fibrograph):					
Upper half mean.....	"	1.11	1.10	1.07	1.06
Mean.....	"	.88	.88	.85	.84
Uniformity ratio.....	Percent	79	80	79	79
Processing results:					
Picker and card waste.....	"	9.2	8.3	13.9	12.1
Neps per 100 sq. in. of					
card web.....	Number	12	12	22	22
Yarn skein strength:					
22s (carded).....	Pounds	128	127	120	120
50s (carded).....	"	45	45	43	42
Yarn appearance grade:					
22s (carded).....	2/ Index	102(C+)	102(C+)	95(C+)	95(C+)
50s (carded).....	"	90(C)	90(C)	80(D+)	80(D+)

1/ Strict Good Ordinary=76, Low Middling=85, Strict Low Middling=94, Middling=100, Strict Middling=104.

2/ D(Very Poor)=70, D+(Poor)=80, C(Fair)=90, C+(Average)=100, B(Good)=110.

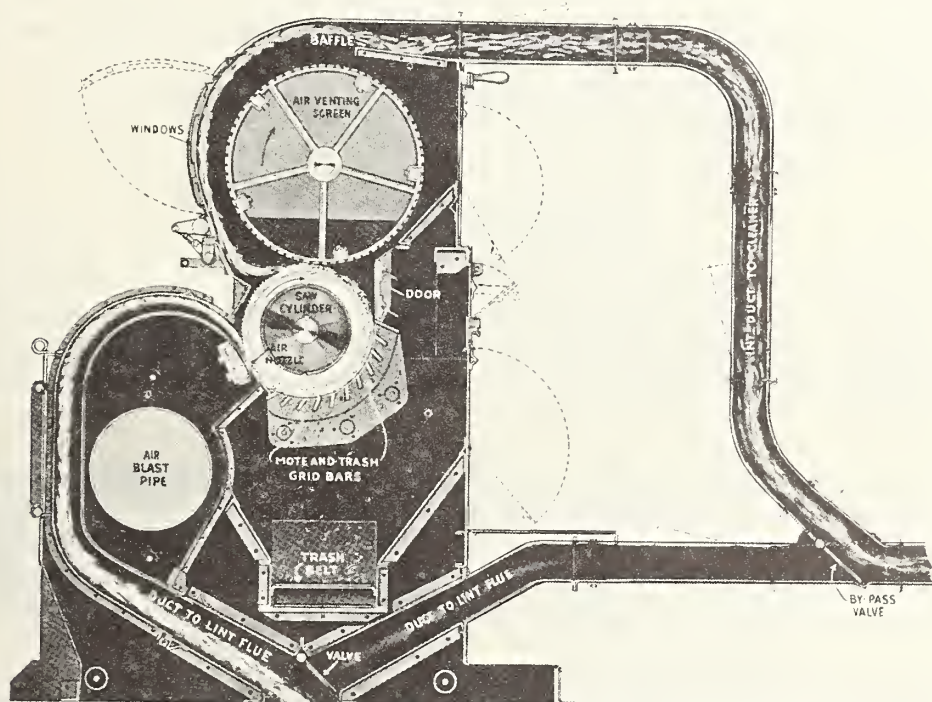
Picker and card waste was, of course, higher for cottons that had not been lint cleaned. The action of a lint cleaner is compensated for, to a large extent, by the opening, picking, and carding machinery in a cotton mill. Laboratory cleaning equipment--openers, pickers, and, particularly, cards--tends to remove a constant amount of fiber from raw cotton (about 4 percent), and trash in proportion to the trash content of the cotton.

In terms of total trash removed through carding, the data indicate that the controlled-bat saw-type lint cleaner and laboratory picker and card combination removed about 6 percent and 11 percent trash from the midseason and late-season bales, respectively, as compared with 5 percent and 10 percent removed by the laboratory picker and card alone. In other words, about 1 percent additional total trash was removed by passing the cotton through the controlled bat saw-type lint cleaners.

FLOW-THROUGH SAW-TYPE LINT CLEANERS

The flow-through saw-type lint cleaner is arranged so that the cotton passes in an uninterrupted flow from the ginning ribs through a rectangular conduit to the lint cleaner saws (fig. 2). The air separator is designed so that the cotton follows the curved surface of the housing rather than touching or forming a bat on the revolving perforated drum. The trash is expelled by centrifugal force between 10 grid bars placed in the path of the rotating saws, and the lint is doffed by an inverted airblast nozzle after the saws have made almost a complete revolution.

The price of this type of lint cleaner usually ran, in 1956, approximately \$2,900 per stand on a 5-stand gin, or a total of \$14,500 for 5 cleaners, f.o.b. factory. Freight to California on 28,000 pounds at \$3.50 per hundred-weight would add \$980 to this amount, while installation at 7 percent of f.o.b. price would add \$1,015. Thus the total cost of cleaners of this type, installed in a 5 - 90 stand San Joaquin Valley gin, would be just under \$16,500, or 8 to 8-1/2 percent of the total cost of the gin plant and equipment.



BN-5571

Figure 2.--Cross-sectional view of flow-through saw-type lint cleaner.

Effect of Flow-Through Saw-Type Lint Cleaners
upon Staple Length

The cleaning of cotton by flow-through saw-type lint cleaners caused no apparent change in the staple length of bales sampled, as determined by the cotton classer. Average fiber lengths were identical before and after lint cleaning in both crop years, 33.9 thirty-seconds of an inch in the 1954 season and 34.3 thirty-seconds of an inch in the 1955 season.

Analysis of Lint Cleaner Waste Removed by
Flow-Through Saw-Type Lint Cleaners

Flow-through saw-type lint cleaners removed an average of nearly 11 pounds of waste material per bale during the 1954 season. This material averaged about 60 percent trash and 40 percent lint. During the 1955 season, these cleaners removed an average of almost 10 pounds of waste material, composed of 58 percent trash and 42 percent lint (table 9).

There was little systematic relationship in either season between the grade of cotton being cleaned, the amount of waste removed, and the composition of this waste. During the second season, both the amounts of waste and the proportion of lint and trash in the waste remained fairly stable over several grades of cotton. Usually one would expect that both the total weight of waste material removed by the lint cleaner and the proportion of actual trash in this waste sample would increase as one moved from higher to lower grades. That was not borne out by this group of samples, however.

Effect of Flow-Through Saw-Type Lint Cleaners
on Grade and Bale Value

Flow-through saw-type lint cleaners improved the grade of machine-harvested cotton by an amount sufficient to increase the average selling price per pound from 32.34 cents to 33.01 cents, or by 67 points, during the 1954 season, and from 32.97 cents to 33.40 cents, or by 43 points, during the 1955 season (tables 10 and 11).

However, this improvement in grade was accomplished by removing an average of 10.9 pounds of waste material from each bale during the 1954 season, and 9.9 pounds during the 1955 season. This was equivalent to reducing the average bale weight from 500.0 to 489.1 pounds in the former season and from 500.0 to 490.1 pounds in the latter season.

When grade improvement and weight loss are both considered, the net result is an average loss in bale value of \$0.33 per bale during 1954 and a loss of \$1.19 per bale during 1955.

From the rather erratic results at these gins, it would be impossible to predict the exact grades on which one might expect to increase the bale value by lint cleaning with flow-through saw-type lint cleaners. It may be observed,

Table 9.--Lint cleaner waste: Amount and kind removed from machine-picked cotton, flow-through saw-type lint cleaners, San Joaquin Valley, California, crop years 1954 and 1955

Grade before lint cleaning	Total lint cleaner waste 1/	Waste analysis 2/			
		Lint content		Trash content	
	Pounds	Pounds	Percent	Pounds	Percent
1954:					
White cotton:					
Strict Low Middling..	13.2	4.9	37	8.3	63
Low Middling.....	11.3	3.9	35	7.4	65
Strict Good Ordinary..	13.3	6.6	49	6.7	51
Good Ordinary.....	8.5	2.8	33	5.7	67
Below Grade.....	8.0	4.1	51	3.9	49
Gray cotton:					
Middling Gray.....	6.4	3.2	50	3.2	50
Strict Low Middling Gray	7.6	3.5	46	4.1	54
All grades.....	10.9	4.4	40	6.5	60
1955:					
White cotton:					
Middling.....	10.2	4.0	39	6.2	61
Strict Low					
Middling Plus.....	10.8	4.6	42	6.2	58
Strict Low Middling..	10.5	4.5	42	6.0	58
Low Middling.....	11.0	4.4	40	6.6	60
Strict Good Ordinary:	14.2	4.8	34	9.4	66
Gray cotton:					
Strict Middling					
Light Gray.....	7.6	3.4	45	4.2	55
Middling Light Gray..	9.1	4.3	47	4.8	53
Strict Low Middling					
Light Gray.....	12.0	4.5	38	7.5	62
All grades.....	9.9	4.1	42	5.8	58

1/ Per 500-pound gross weight bale.

2/ As determined by Shirley Analyzer test.

Table 10. --Grade, bale weight, and bale value: Machine-picked cotton before and after lint cleaning, flow-through saw-type lint cleaners, San Joaquin Valley, California, crop of 1954

Grade before lint cleaning	Grade after lint cleaning										Fresno price		Weight of:		Bale value		Gain or	
	White grades					Gray grades					per pound 1/		500-pound:		Before : After :		loss	
Total :	M :	SLM* :	SLM :	LM* :	LM :	SGO :	GO :	BG :	M 1st G :	WG :	SLM :	SLM :	1st G :	SLMG :	cleaning :	cleaning :	cleaning :	value
Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales
<u>White grades</u>																		
Middling.....	2	2													35.59	35.59	482.8	177.95
Strict Low Middling Plus..	1	1													34.77	35.59	489.5	173.85
Strict Low Middling.....	36	18	2	16											34.36	35.00	486.8	171.80
Low Middling Plus.....	1			1											33.27	34.36	489.5	166.35
Low Middling.....	8	1	2	4					1						32.72	34.42	488.7	163.60
Strict Good Ordinary.....	2					1					1				29.91	30.63	486.7	149.55
Good Ordinary.....	3							2				1			27.93	27.41	491.5	139.65
Below Grade.....	4							2			2				25.93	28.16	492.0	129.65
<u>Gray grades</u>																		
Middling Light Gray.....	1									1					32.83	32.83	489.5	164.15
Middling Gray.....	2									1					32.32	31.35	493.6	161.60
Strict Low Middling																		
Light Gray.....	1										1				31.35	31.35	488.2	156.75
Strict Low Middling Gray..	21							2			8	3	8		30.38	30.83	492.4	151.90
All bales.....	82	22	4	21	-	-	1	-	6	2	9	5	12		32.34	33.01	489.0	161.71
1/ Based on season average price quotations for 1-1/16 inch staple length cotton; prices estimated for "plus" grades and Light Gray and Below Grade cotton.																		

Table 11.--Grade, bale weight, and bale value: Machine-picked cotton before and after lint cleaning, flow-through saw-type lint cleaners, San Joaquin Valley, California crop of 1955

Grade before lint cleaning	Grade after lint cleaning										Fresno price		Weight of		Bale value		Gain or loss	
	White grades					Gray grades					per pound	1/500-pound	Before		After			
	Total	SM	M+	M	SLM+	SLM	LM	SOO	GMG	lt G			SM	lt G	SM	lt G		SLM
	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Dollars
White grades																		
Strict Middling.....												36.62	-	-	-	-	-	-
Middling Plus.....	1	1										35.98	36.62	488.9	488.9	179.90	179.04	-0.86
Middling.....	17	1	16									35.66	35.68	489.8	489.8	178.30	174.76	-3.54
Strict Low Middling Plus..	4	2	2									34.49	35.08	489.2	489.2	172.45	171.61	-84
Strict Low Middling.....	16	3				6		1	5			33.90	33.58	489.5	489.5	169.50	164.37	-5.13
Low Middling.....	13					1	4			1	7	31.18	31.97	489.0	489.0	155.90	156.33	.43
Strict Good Ordinary.....	2										1	28.28	31.06	485.8	485.8	141.40	150.89	9.49
Gray grades																		
Good Middling Gray.....	-																	
Strict Middling Light Gray.....	20		5						3	5	7	32.80	33.49	492.4	492.4	164.00	164.90	.90
Strict Middling Gray.....	1							1				32.69	32.80	491.9	491.9	163.15	161.34	-2.11
Middling Light Gray.....	9					1				2	6	32.05	32.40	490.9	490.9	160.25	159.05	-1.20
Middling Gray.....	1										1	31.41	32.05	490.9	490.9	157.05	157.33	.28
Strict Low Middling Light Gray.....	8											30.06	30.98	488.0	488.0	150.30	151.18	.88
Strict Low Middling Gray	-											28.72	-	-	-	-	-	-
All bales.....	92	1	1	26	2	8	4	-	4	11	11	16	3	4	1	164.86	163.67	-1.19

1/ Based on season average price quotations for 1-1/16 inch staple length cotton; prices estimated for "plus" grades and Light Gray cotton.

however, that with one exception, the lint cleaning of cotton which, without such cleaning, would grade Strict Low Middling or higher resulted in a loss in bale value. This exception was the one bale of Strict Low Middling Plus which showed a 36-cent gain in the 1954 season.

Among the lower grades, Low Middling Plus, Low Middling, and Below Grade showed gains in bale value during the 1954 season, while Strict Good Ordinary, Good Ordinary, and all Gray grades showed losses. During the 1955 season Low Middling White again showed a slight gain in bale value. Strict Good Ordinary White, which had shown a small loss in 1954, showed a substantial gain in 1955. While all Gray grades had shown losses in 1954, in 1955 only Strict Middling Gray and Middling Light Gray showed losses, while three other Gray grades showed modest gains in bale value.

The result of lint cleaning the better grades of White cotton (Strict Low Middling and higher) with flow-through saw-type lint cleaners was almost invariably a loss in bale value. The result of cleaning the lower White grades and Gray cottons was more variable, sometimes resulting in a gain, and other times in a loss.

This analysis deals only with changes in bale value and does not take into consideration the charge for the lint cleaning service, which the farmer would have to consider in determining the total economic consequences to himself from lint cleaning. These charges, usually 10 cents per hundredweight of seed cotton, would have averaged \$1.76 per bale for the bales sampled during the 1954 season, and \$1.56 per bale for the bales sampled during the 1955 season.

Effect of Flow-Through Saw-Type Lint
Cleaning on Fiber Properties and
Processing Performance

The only obvious effect of flow-through saw-type lint cleaners upon fiber properties and processing performance was a reduction in the amount of picker and card waste removed at the laboratory (table 12). The reductions, averaging 1.0 percent for midseason cotton and 0.9 percent for the late-season lots, corresponded roughly to the slightly more than 1 percent trash removed by the lint cleaners. Fiber length as measured by the Fibrograph, neps in the card web, and laboratory yarn quality factors apparently were not affected by lint cleaning.

Table 12.--Laboratory fiber and spinning test results: Machine-picked cotton before and after lint cleaning, flow-through saw-type lint cleaners, San Joaquin Valley, California, crop years 1954 and 1955

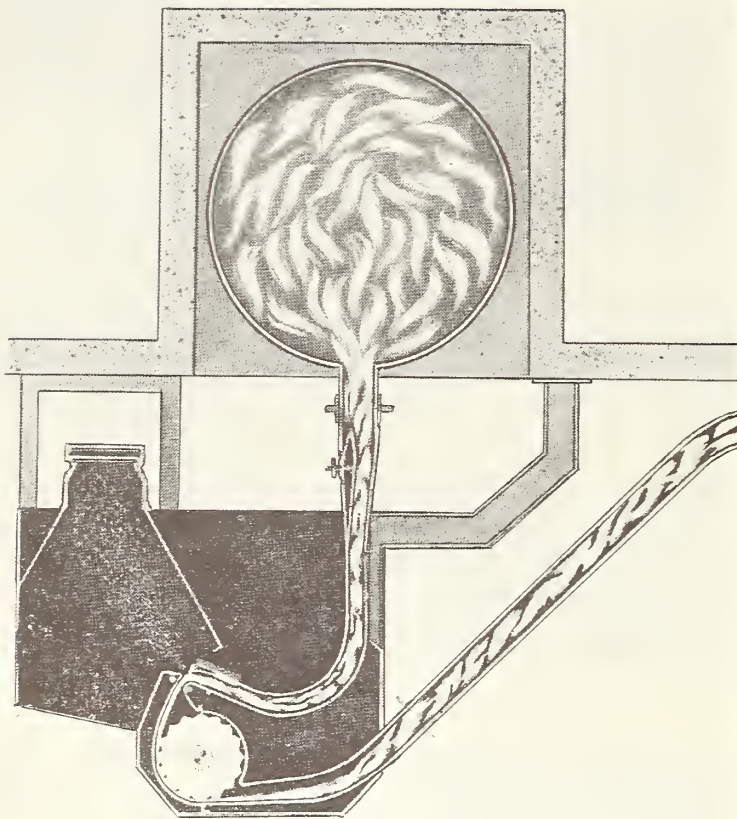
Test item	Unit	Midseason cotton		Late-season cotton	
		Before	After	Before	After
		lint	lint	lint	lint
		cleaning:	cleaning:	cleaning:	cleaning:
Raw cotton quality:					
Classification:					
Grade.....	1/ Index	96(SLM+)	98(M)	80(SGO+)	84(MG)
Staple length.....	Inches	1-3/32	1-3/32	1-1/32	1-1/32
Fiber length (Fibrograph):					
Upper half mean.....	"	1.10	1.09	1.05	1.06
Mean.....	"	.88	.87	.82	.84
Uniformity ratio.....	Percent	80	80	78	79
Processing results:					
Picker and card waste.....	"	9.2	8.2	11.4	10.5
Neps per 100 sq. in. of					
card web.....	Number	10	11	32	29
Yarn skein strength:					
22s (carded).....	Pounds	130	131	118	117
50s (carded).....	"	47	46	42	41
Yarn appearance grade:					
22s (carded).....	2/ Index	105(B)	105(B)	90(C)	85(C)
50s (carded).....	"	92(C)	90(C)	65(D)	70(D)

1/ Strict Good Ordinary=76, Low Middling=85, Strict Low Middling=94, Middling=100, Strict Middling=104.

2/ D(Very Poor)=70, D+(Poor)=80, C(Fair)=90, C+(Average)=100, B(Good)=110.

AIR-BEATER-CENTRIFUGAL TYPE LINT CLEANERS

The air-beater-centrifugal type lint cleaner is so arranged that as the lint leaves the gin stand it is carried in a stream of air upward and over an agitating cylinder which fluffs the lint so that the trash may be more easily removed (fig. 3). The rim speed of the discs of the agitating cylinder is approximately twice the velocity of air which is conveying the lint at this point. This speeds up and directs the flow of lint to the moting point and stripper bar, where centrifugal force expels the leaf trash, grass, motes, and fine particles from the lint. These particles drop onto a conveyor belt while the air carries the lint on into the lint flue. This type of unit contains no saws, and the cleaning is accomplished while the lint is moving in the air stream.



BN-5572

Figure 3.--Cross-sectional view of air-beater-centrifugal type lint cleaner.

These lint cleaners sold f.o.b. factory in 1956 at between \$2,000 and \$2,5000 per unit, depending upon the amount of extra equipment necessary to the particular installation. Thus an average price for air-beater-centrifugal lint cleaners with necessary accessories f.o.b. factory would be in the neighborhood of \$2,250 per unit, or \$11,250 for a 5 - 90 stand gin outfit. These lint cleaners with all necessary extras weigh approximately 2,400 pounds per unit, or 12,000 pounds for 5 units. Freight charges to California at \$3.50 per hundredweight would add \$420 to the f.o.b. cost. Installation costs, computed at 7 percent of the f.o.b. price, would be \$787.50. Thus, the total cost of air-beater-centrifugal lint cleaners installed in a 5 - 90 saw stand gin in San Joaquin Valley would be slightly under \$12,500, or a little over 6 percent of the cost of the gin.

Effect of Air-Beater-Centrifugal Type Lint Cleaners Upon Staple Length

Lint cleaning by air-beater-centrifugal type lint cleaners had no effect upon the length of the fiber in machine-picked bales sampled during either the 1954-55 or 1955-56 season, according to the cotton classers. Staple lengths averaged 34.0 thirty-seconds of an inch before and after lint cleaning for the 1954 season, and 34.9 thirty-seconds of an inch for both methods in the 1955 season.

Analysis of Lint Cleaner Waste Removed by
Air-Beater-Centrifugal Type Lint Cleaners

The air-beater-centrifugal type lint cleaners removed an average of 8 pounds of waste from machine-picked cotton during the 1954 season, of which 86 percent was trash and 14 percent was waste lint (table 13). During the 1955 season, when grades averaged higher, these cleaners removed an average of only 5.5 pounds of waste per bale, of which 88 percent was actual trash and only 12 percent was waste lint. Although the total pounds of waste removed varied considerably among grades, particularly during the first season, the lint-trash content of this waste varied only within a narrow range during both seasons.

Effect of Air-Beater-Centrifugal Lint Cleaners
on Grade and Bale Value

The air-beater-centrifugal type lint cleaners improved the grades of machine-picked cotton by an amount sufficient to increase the average selling price per pound from 31.98 to 32.48 cents, or by 50 points, during the 1954 season, and from 34.64 to 34.92 cents, or by 28 points, during the 1955 season (tables 14 and 15).

This improvement in grade, however, was accomplished at the expense of a decrease in bale weight from 500.0 to 491.8 pounds, or a reduction of 8.2 pounds in the 1954 season, and from 500.0 to 494.5 pounds, or a reduction of 5.5 pounds, in the 1955 season.

When both grade improvement and weight loss were considered, the net result was an average loss in bale value of 20 cents per bale on the bales sampled during the 1954 season, and an average loss of 57 cents per bale on the bales sampled during the 1955 season.

In general, passing the higher white grades of lint cotton through air-beater-centrifugal type lint cleaners decreased bale value, while passing the lower grades through these cleaners increased bale value. These tendencies were subject to exceptions, however, and it is difficult to locate the precise dividing line between the grades which made a gain through lint cleaning and those which showed a loss.

During the 1954 season, most grades above Strict Good Ordinary appeared to lose in bale value through lint cleaning. During the 1955 season, on the other hand, when price differentials for grade were greater, only the Middling and Strict Low Middling grades reflected a loss in bale value through lint cleaning, while Strict Low Middling Plus and the lower grades registered gains.

The farmer must pay the charge which the gin makes for the lint cleaning service. This charge, usually 10 cents per hundredweight of seed cotton, averaged \$1.64 for the bales sampled during the 1954 season and \$1.56 for bales sampled during the 1955 season. This amount would have to be subtracted from

Table 13.--Lint cleaner waste: Amount and kind removed from machine-picked cotton, air-beater-centrifugal type lint cleaners, San Joaquin Valley, California, crop years 1954 and 1955

Grade before lint cleaning	Total lint cleaner: waste 1/	Waste analysis 2/			
		Lint content		Trash content	
	Pounds	Pounds	Percent	Pounds	Percent
1954:					
White cotton:					
Strict Low Middling Plus..	6.3	1.3	20	5.0	80
Strict Low Middling.....	6.6	0.9	14	5.7	86
Low Middling Plus.....	11.1	1.2	11	9.9	89
Low Middling.....	8.7	1.3	15	7.4	85
Strict Good Ordinary.....	7.1	1.0	14	6.1	86
Below Grade.....	13.2	1.8	14	11.4	86
Spotted cotton:					
Middling Light Spotted....	14.7	2.1	14	12.6	86
Strict Low Middling Light Spotted.....	9.9	0.8	8	9.1	92
Gray cotton:					
Strict Low Middling Light Gray.....	5.8	0.7	12	5.1	88
All grades.....	8.2	1.1	14	7.1	86
1955:					
White cotton:					
Middling.....	5.5	.7	12	4.8	88
Strict Low Middling Plus..	5.1	.7	13	4.4	87
Strict Low Middling.....	5.6	.7	12	4.9	88
Low Middling Plus.....	5.5	.5	9	5.0	91
Low Middling.....	8.8	1.0	11	7.8	89
All grades.....	5.5	0.7	12	4.8	88

1/ Per 500-pound gross weight bale.

2/ As determined by Shirley Analyzer test.

Table 15.--Grade, bale weight, and bale value: Machine-picked cotton before and after lint cleaning, air-benter-centrifugal type lint cleaner, San Joaquin Valley, California, crop of 1955

Grade before lint cleaning	Grade after lint cleaning						Fresno price		Weight of		Bale value		Gain or loss in bale value
	White grades						per pound 1/ 500-pound		Before : After : Before : After :		Before : After :		
	Total	M+ :	M :	SLM+ :	SLM :	LM+ :	LM :	lint :	lint :	lint :	lint :	lint :	
	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Cents	Cents	Pounds	Dollars	Dollars	Dollars
White grades													
Middling Plus.....	-							35.98	--	--	--	--	--
Middling.....	62	3	58	1				35.66	35.66	194.5	178.30	176.34	-1.96
Strict Low Middling Plus.....	36		17	18	1			34.19	35.03	194.9	172.45	173.36	.91
Strict Low Middling.....	31		4	3	24			33.90	34.18	194.4	169.50	168.99	-.51
Low Middling Plus.....	8				4	4		32.09	33.00	194.5	160.45	163.19	2.74
Low Middling.....	4			1				31.18	31.86	194.4	155.90	156.56	.66
All bales.....	144	3	79	22	30	4	3	31.64	31.92	194.5	173.22	172.65	-.57
1/ Based on season average price quotation for 1-1/16 inch staple length cotton; prices estimated for "plus" grades.													

the indicated gains in bale value or added to the indicated losses in order to determine the total effect of air-beater-centrifugal type lint cleaning upon returns to farmers. Thus, of the bales sampled, only Strict Good Ordinary and Below Grade cotton in the 1954 season, and Low Middling Plus cotton in the 1955 season gained sufficiently in bale value through air-beater-centrifugal type lint cleaning to offset lint cleaning charges.

Effect of Air-Beater-Centrifugal Type Lint
Cleaners on Fiber Properties and Processing Performance

Aside from the improvement in grade discussed previously, the only consistent effect of the air-beater-centrifugal lint cleaners on the sample bales was a reduction in the amount of picker and card waste removed from the lint cleaned bales at the laboratory (table 16). Nep counts for the late-season

Table 16.--Laboratory fiber and spinning test results: Machine-picked cotton before and after lint cleaning, air-beater-centrifugal type lint cleaners, San Joaquin Valley, California, crop years 1954 and 1955

Test item	Unit	Midseason cotton		Late-season cotton	
		Before	After	Before	After
		lint	lint	lint	lint
		cleaning	cleaning	cleaning	cleaning
Raw cotton quality:					
Classification:					
Grade.....	1/ Index	92(SLM)	95(SLM+)	90(LM+)	92(SLM)
Staple length.....	Inches	1-3/32	1-3/32	1-1/16	1-1/16
Fiber length (Fibrograph):					
Upper half mean.....	"	1.12	1.10	1.07	1.07
Mean.....	"	.90	.88	.85	.85
Uniformity ratio.....	Percent	80	80	79	79
Processing results:					
Picker and card waste.....	"	10.2	9.5	11.6	10.6
Neps per 100 sq. in. of card web.....	Number	9	11	12	21
Yarn skein strength:					
22s (carded).....	Pounds	129	130	124	126
50s (carded).....	"	46	46	45	45
Yarn appearance grade:					
22s (carded).....	2/ Index	105(B)	100(C+)	97(C+)	97(C+)
50s (carded).....	"	90(C)	92(C)	80(D+)	80(D+)

1/ Strict Good Ordinary=76, Low Middling=85, Strict Low Middling=94, Middling=100, Strict Middling=104.

2/ D(Very Poor)=70, D+(Poor)=80, C(Fair)=90, C+(Average)=100, B(Good)=110.

lint cleaned samples were somewhat higher than those from the control bales, 12 and 21 per 100 square inches of card web, respectively, but that trend, which was not consistent, probably reflected random sampling fluctuations rather than real differences between cottons.

Picker and card waste removed at the laboratory from the control bales exceeded that removed from the lint cleaned bales by about 1 percent. These lint cleaners removed roughly 5 to 8 pounds of trash, or slightly over 1 percent of the weight of comparable bales passed through them. In terms of total trash removed through carding, therefore, the laboratory picker and card combination was about as effective on the control samples as the lint cleaner and picker and card combination on the lint cleaned samples.

AIR-CENTRIFUGAL TYPE LINT CLEANERS

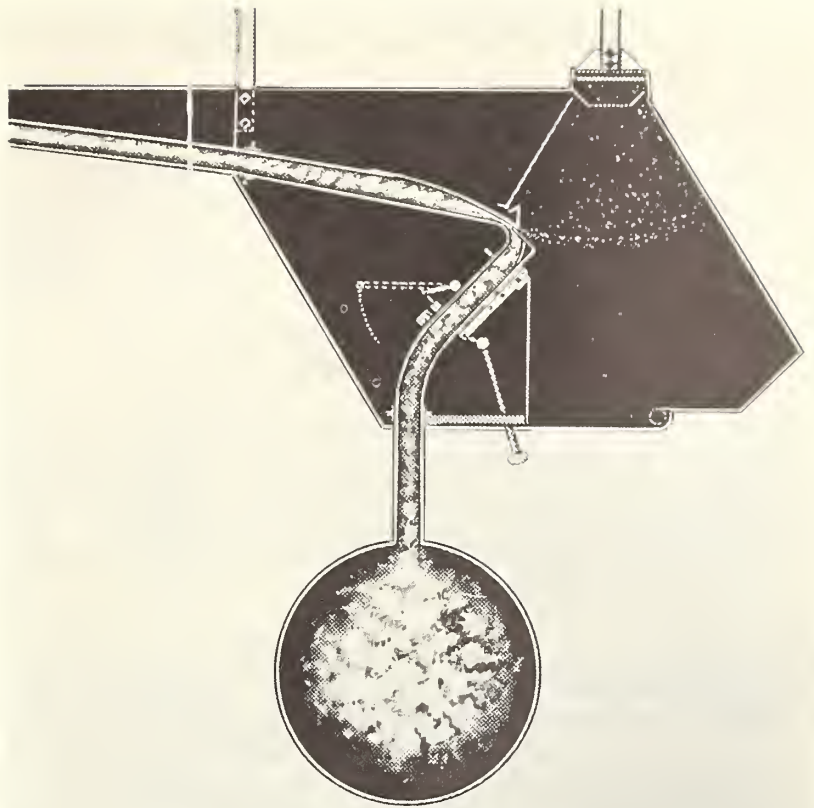
The air-centrifugal type lint cleaner is the simplest type of cleaner currently in use, since it has no moving parts at all (fig. 4). It cleans by the principle of centrifugal force operating in a specially designed air chamber. The lint comes from the gin stand floating on a stream of air. At the upward bend of the gin flue, there is an aperture. The trash, being heavier than the lint, falls to the bottom and out the aperture. The cotton lint continues to the lint flue and on to the condenser.

The price of a set of 5 of these lint cleaners, with all necessary accessories for installation in a new 5 - 90 saw outfit, in 1956 was about \$9,150 f.o.b. factory. Freight charges to California at \$3.50 per hundredweight on 12,000 pounds would add \$420 to the f.o.b. cost. Estimated installation costs were only about \$180 if air-centrifugal lint cleaners were placed in a new plant of the same make as the cleaners at the time of erection of the plant. Thus the total cost of 5 air-centrifugal type lint cleaners, installed under these circumstances, would be in the neighborhood of \$9,750, about 5 percent of the total cost of the gin.

Costs are somewhat higher in an existing plant or for a new plant of a make different from the cleaners. The f.o.b. price of 5 air-centrifugal type cleaners with all necessary accessories for these installations would run about \$10,765 if the plant contained a suitable condenser. A new condenser with supports would cost about \$2,300, bringing the total f.o.b. price to \$13,065. Freight to California is figured at \$420 without the condenser or \$560 with the condenser, while installation is estimated at \$360 without the condenser or \$480 with the condenser. Thus the total cost of 5 air-centrifugal lint cleaners installed in an existing California plant or in a new plant of other make would be about \$11,545 if the plant already had a suitable condenser, and approximately \$14,005 if the condenser had to be replaced.

Effect of Air-
Centrifugal Type
Lint Cleaners
on Staple Length

The lint cleaning of cotton by air-centrifugal type lint cleaners caused no apparent change in the staple length of bales sampled during the 1954 season, when average length, as determined by cotton classers, equaled 34.0 thirty-seconds of an inch both before and after lint cleaning. During the 1955 season, the cotton was called 34.9 thirty-seconds of an inch before lint cleaning and 35.0 thirty-seconds of an inch after lint cleaning. The change noted during the latter season, however, was so small as to be without practical significance.



BN-5572

Figure 4.--Cross-sectional view of air-centrifugal type lint cleaner.

Analysis of Lint Cleaner Waste Removed by
Air-Centrifugal Type Lint Cleaners

Air-centrifugal type lint cleaners removed an average of nearly 9 pounds of waste material from each bale of machine-picked cotton sampled during the 1954 season, of which 86 percent was actual trash and 14 percent was lint (table 17). During the 1955 season, these cleaners removed an average of over 7 pounds of waste material per bale of machine-picked cotton sampled, of which 90 percent was actual trash. The total amount of waste removed per bale varied markedly among the different grades of cotton in each season, but this variation appeared to be of a random nature. The proportion of actual trash in the waste samples varied among the several grades only within fairly narrow limits, ranging from 76 to 90 percent in the 1954 season, and from 88 to 93 percent in the 1955 season.

Both the air-centrifugal type and the air-beater-centrifugal type lint cleaners were sparing in the amount of lint removed. For each type, the

Table 17.--Lint cleaner waste: Amount and kind removed from machine-picked cotton, air-centrifugal type lint cleaners, San Joaquin Valley, California, crop years 1954 and 1955

Grade before lint cleaning	Total	Waste analysis 2/			
	lint cleaner: waste 1/	Lint content	Trash content		
	Pounds	Pounds	Percent	Pounds	Percent
1954:					
White cotton:					
Middling.....	10.4	1.5	14	8.9	86
Strict Low Middling Plus.....	15.0	2.5	17	12.5	83
Strict Low Middling.....	13.8	2.3	17	11.5	83
Low Middling Plus.....	4.8	0.5	11	4.3	89
Low Middling.....	5.3	0.5	10	4.8	90
Strict Good Ordinary Plus.....	8.0	1.1	14	6.9	86
Strict Good Ordinary.....	7.8	1.3	16	6.5	84
Gray cotton:					
Middling Light Gray.....	5.2	1.2	24	4.0	76
Strict Low Middling Light Gray:	6.4	1.1	18	5.3	82
All grades.....	8.9	1.2	14	7.7	86
1955:					
White cotton:					
Middling.....	6.6	0.7	10	5.9	90
Strict Low Middling Plus.....	6.3	0.7	11	5.6	89
Strict Low Middling.....	6.6	0.8	12	5.8	88
Low Middling Plus.....	6.0	0.6	9	5.4	91
Low Middling.....	10.9	1.0	9	9.9	91
Strict Good Ordinary Plus.....	11.7	1.2	11	10.5	89
Strict Good Ordinary.....	12.7	0.8	7	11.9	93
All grades.....	7.2	0.7	10	6.5	90

1/ Per 500-pound gross weight bale.

2/ As determined by Shirley Analyzer test.

average lint removal was only a little more than a pound of lint per bale during the first season and less than a pound per bale during the second season, when grades were higher.

Effect of Air-Centrifugal Type Lint Cleaners
on Grade and Bale Value

Air-centrifugal type lint cleaners raised the grades of machine-picked cotton during the 1954 season by an amount sufficient to increase the average selling price from 32.86 to 33.31 cents per pound, or by 45 points (table 18). During 1955, the improvement in grade brought about by the air-centrifugal type lint cleaners was only sufficient to increase the average selling price per pound from 33.95 to 34.16 cents, or by 21 points (table 19). A principal reason for the smaller improvement during the second season was the greater proportion of higher grades. The higher the grade, in general, the smaller the potential increase in average value through lint cleaning.

Improvements in grade and selling price per pound were offset by reductions in bale weight through removal of lint cleaner waste. Lint cleaning resulted in an average reduction in bale weight from 500.0 to 491.1 pounds during the 1954 season, or a decrease of 8.9 pounds per bale. During the 1955 season, bale weights were reduced on the average from 500.0 to 492.8 pounds, or by 7.2 pounds per bale.

When both grade improvements and weight losses are taken into consideration, the net result was a decrease in average bale value from \$164.30 to \$163.56, a loss of 74 cents, during the 1954 season, and a decrease from \$169.74 to \$168.36, a loss of \$1.38, during the 1955 season.

As with other types of cleaners, the effect upon bale value of cotton cleaned with air-centrifugal type lint cleaners varied markedly with the price of cotton prior to cleaning. In general, the higher grades tended to be reduced in bale value while the lower grades were enhanced in bale value. It is difficult to arrive at a precise dividing line because, within each season, differences among grades were somewhat erratic, and also because results varied within grades from one season to the next. During the 1954 season, all cotton of Strict Good Ordinary Plus grade and higher was reduced in bale value, while cotton of several grades from Strict Good Ordinary down was increased in bale value. During the 1955 season, when grade differentials were wider, the pattern differed in that only some of the higher grades showed losses in bale value while others showed gains. The grades of Middling Plus, Middling, Strict Low Middling Plus, Low Middling Plus, and Low Middling showed losses in bale value, but bale value was enhanced somewhat for the grades of Strict Low Middling, Strict Good Ordinary Plus, and Strict Good Ordinary. The increase in bale value of all grades except Strict Good Ordinary Plus and Strict Good Ordinary, however, was insufficient to pay the lint cleaning charges.

The charges for lint cleaning, which affect the returns to farmers, usually are 10 cents per hundredweight of seed cotton processed. They averaged \$1.63 per bale for the bales sampled during the 1954 season and \$1.51 per bale for bales sampled during the 1955 season. Thus, only Strict Good Ordinary, Good Ordinary Plus, and Strict Low Middling Light Gray cotton during the 1954 season, and Strict Good Ordinary Plus and Strict Good Ordinary cotton during the 1955 season showed gains in bale value sufficient to net a profit to the grower after lint cleaning charges were paid.

Table 18.--Grade, bale weight, and bale value: Machine-picked cotton before and after lint cleaning, air-centrifugal type lint cleaner, San Joaquin Valley, California, crop of 1951

Grade before lint cleaning	Grade after lint cleaning										Fresno price per pound 1/500-round		Bale value		Gain or loss in bale value
	White grades					Gray grades					Before	After	Before	After	
Total	M	SLM+	SLM	LM+	LM	SGO+	SGO	GO+	GO	LM	SLM	SLM	LM	SGO	GO
Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales
Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
White grades															
Middling.....	1	1									34.77	35.59	177.95	170.23	-7.72
Strict Low Middling Plus.....	20	11	9								34.77	35.22	173.85	170.82	-3.03
Strict Low Middling.....	10	3	5	2							34.36	34.93	171.80	169.83	-1.97
Low Middling Plus.....	5			4						1	33.27	33.18	166.35	164.31	-2.04
Low Middling.....	32			16	6					10	32.72	33.03	163.60	163.40	-.20
Strict Good Ordinary Plus.....	5			1	2	1				1	30.85	30.94	154.25	152.22	-2.03
Strict Good Ordinary.....	9		1	2	1	4				1	29.91	31.16	149.55	154.75	5.20
Good Ordinary Plus.....	1					1					28.59	29.91	142.95	147.34	4.39
Good Ordinary.....	1									1	27.93	27.93	139.65	137.14	-2.51
Spotted grades															
Low Middling Light Spotted.....	1									1	28.39	28.39	141.95	138.74	-3.21
Gray grades															
Middling Light Gray.....	6									6	32.83	32.83	164.15	162.44	-1.71
Strict Low Middling Light Gray:	2									2	31.35	32.83	156.75	162.05	5.30
Strict Low Middling Gray.....	-									-	30.38	-	-	-	-
All bales.....	93	14	15	3	20	9	3	6	-	1	32.86	33.31	164.30	163.56	-.74

1/ Based on season average price quotations for 1-1/16 inch staple length cotton; prices estimated for "plus" grades, Light Spotted, and Light Gray cotton.

Table 19.--Grade, bale weight, and bale value: Machine-picked cotton before and after lint cleaning, air-centrifugal type lint cleaner, San Joaquin Valley, California, crop of 1955

Grade before lint cleaning	Grade after lint cleaning										Fresno price		Weight of		Bale value		Gain or loss in bale value								
	White grades										per pound l/ 500-pound		Before : After :		Before : After :										
	Total :		M+ :		M :		SLM+ :		SLM :		LM+ :		LM :		SGO+ :			SGO :		lint : lint :		after lint : cleaning :		after lint : cleaning :	
	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Cents	Cents	Pounds	Dollars		Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	
White grades																									
Middling Plus.....	3	2	1									35.98	35.87	491.1	179.90	176.16							-3.74		
Middling.....	55	17	38									35.66	35.76	493.4	178.30	176.44							-1.86		
Strict Low Middling Plus..	14		6	4	4							34.49	34.82	493.7	172.45	171.91							- .54		
Strict Low Middling.....	27		6	11	10							33.90	34.53	493.4	169.50	170.37							.87		
Low Middling Plus.....	20			7	7	4					2	32.09	32.16	493.4	160.45	158.68							-1.77		
Low Middling.....	8					3	2	3				31.18	29.61	489.1	155.90	144.82							-11.08		
Strict Good Ordinary Plus..	4					3		1				29.25	30.46	488.3	146.25	148.74							2.49		
Strict Good Ordinary.....	5					3		2				28.28	30.02	487.3	144.40	146.29							4.89		
All bales.....	136	19	51	15	21	7	13	2	8			33.95	34.16	492.8	169.74	168.36							-1.38		

1/ Based on season average price quotations for 1-1/16 inch staple length cotton; prices estimated for "plus" grades.

Effect of Air-Centrifugal Type Lint Cleaners
on Fiber Properties and Processing Performance

As with the other 3 types of lint cleaners discussed previously, lint cleaning had no discernible effect on fiber length distribution, neps in the card web, laboratory yarn skein strength, or yarn appearance grade (table 20).

Grades were raised somewhat through lint cleaning, and percentages of picker and card waste were lower for the lint cleaned bales than for the control bales, reflecting the removal of waste from the lint cleaned bales at the gin. The excess of waste removed from the control bales at the laboratory, 1.2 percent, corresponded rather closely to the 7 pounds (or 1.4 percent) of trash removed at the gin by the lint cleaners, indicating that, to a large extent, the two gin and laboratory cleaning combinations offset each other.

Table 20.--Laboratory fiber and spinning test results: Machine-picked cotton before and after lint cleaning, air-centrifugal type lint cleaners, San Joaquin Valley, California, crop years 1954 and 1955

Test item	Unit	Midseason cotton : Late-season cotton			
		Before : After		Before : After	
		lint : lint		lint : lint	
		:cleaning:cleaning		: cleaning:cleaning	
Raw cotton quality:	:	:	:	:	:
Classification:	:	:	:	:	:
Grade.....	1/ Index	99(M)	100(M)	88(LM+)	89(LM+)
Staple length.....	Inches	1-3/32	1-3/32	1-1/16	1-1/16
Fiber length (Fibrograph):	:	:	:	:	:
Upper half mean.....	"	1.12	1.11	1.11	1.11
Mean.....	"	.91	.89	.89	.89
Uniformity ratio.....	Percent	81	80	80	80
Processing results:	:	:	:	:	:
Picker and card waste.....	"	9.0	7.8	10.5	9.3
Neps per 100 sq. in. of	:	:	:	:	:
card web.....	Number	14	10	16	18
Yarn skein strength:	:	:	:	:	:
22s (carded).....	Pounds	127	130	126	125
50s (carded).....	"	46	46	45	44
Yarn appearance grade:	:	:	:	:	:
22s (carded).....	2/ Index	103(C+)	103(C+)	102(C+)	100(C+)
50s (carded).....	"	97(C+)	90(C)	88(C)	85(C)

1/ Strict Good Ordinary=76, Low Middling=85, Strict Low Middling=94, Middling=100, Strict Middling=104.

2/ D(Very Poor)=70, D+(Poor)=80, C(Fair)=90, C+(Average)=100, B(Good)=110.

SOME PROBLEMS ASSOCIATED WITH USE OF LINT CLEANERS

Need for Selective Use

Lint cleaners were developed originally to offset the grade reductions which resulted from mechanical harvesting of cotton; the growth of lint cleaning has closely paralleled that of machine picking. The first machines developed to pick cotton gathered a relatively large amount of trash along with the lint, compared to hand-picked cotton. Pickers have been improved, however; operators have learned new skills; breeders have developed varieties of cotton especially adapted to machine picking; and the chemical industry has contributed defoliant which remove much of the leaf from the plant before harvesting. Now machine-picked cotton can match hand-picked cotton in grade when it is handled properly.

As lint cleaners spread across the Cotton Belt, ginners began to pass through them hand-picked cottons as well as hand-snapped and machine-harvested cottons. Handling all bales in the same manner simplifies ginning, particularly during the rush at the height of the season. And, of course, the cleaners must handle a large volume of cotton if they are to pay their way. Growers have encouraged that practice because the price per pound of their lint frequently is raised.

Today, the general practice at most gins equipped with lint cleaners is to clean all bales as the cotton leaves the gin saws--early-season and late-season cotton, hand-harvested and machine-harvested cotton.

Studies of the economics of lint cleaning, however, have indicated that above some point in the grade structure growers lose money by having their cotton passed through the cleaners, even when cotton is sold in markets where full central-market differentials for quality are paid. Losses in weight more than compensate for gains, if any, in prices per pound. The critical grade varies with the kind of cotton produced and the type of trash it contains, of course, and especially with the premiums and discounts received by the grower for the various grades.

When lint cleaning was first getting well established in 1949-50, for example, price spreads among the several grades, as indicated by central-market quotations, were relatively large (table 21). For the next 4 to 5 years, premiums and discounts narrowed, reducing the possibility for profits from lint cleaning. During the past several years, however, the spreads have widened again, and in 1956-57 the discount of 292 points per pound (100 points equal 1 cent) for Strict Low Middling cotton of 1-inch staple length again was more than twice the 132 points in 1952-53. In other words, if a grower sold in markets where price differentials paid for grade differences approximated those quoted in the designated spot markets, his chances of making money by lint cleaning Strict Low Middling 1-inch cotton were more than twice as good in both 1949-50 and 1956-57 as in 1952-53. A similar pattern held for other grades. Growers selling in markets where price differentials paid for grade

Table 21.--Premiums and discounts for grades, and prices per pound for Middling 1-inch cotton: Annual averages, designated spot markets, 1949-57 ^{1/}

Year	Premiums		Price,	Discounts			
beginning:	Good	Strict	Middling	Strict Low	Low	Strict Good	Good
August 1	Middling	Middling	1-inch	Middling	Middling	Ordinary	Ordinary
	Points	Points	Cents	Points	Points	Points	Points
1949.....	93	82	32.65	316	622	875	1,069
1950.....	86	75	43.23	242	405	556	682
1951.....	91	66	39.94	185	512	750	962
1952.....	58	40	35.32	132	449	715	948
1953.....	48	35	34.36	142	452	686	873
1954.....	55	43	35.02	162	410	595	767
1955.....	81	65	35.45	242	518	722	894
1956.....	86	71	33.53	292	605	884	1,098

^{1/} Cotton Price Statistics, Cotton Division, AMS, U. S. Department of Agriculture, August 1957.

were much less or where "hog-round" buying (with no price differentiation for quality) was practiced would, of course, have little, if any, chance of benefiting from the use of lint cleaners. In such instances, individual growers would benefit only to the extent that the average price paid in the market in which they were selling would be raised to reflect the better grades resulting from use of lint cleaners.

It is apparent, therefore, that selective use must be made of lint cleaners if growers are to benefit from their use to the fullest extent. The cleaners cannot be used profitably on every bale.

Relation Between Cotton Grading and Lint Cleaning

A problem that is distinct from, yet closely associated with, the selective use of lint cleaners relates to the effect of lint cleaning on the grading of cotton.

Cotton is classed for grade on the basis of three factors--color, leaf, and preparation. ^{7/} Preparation, the degree of smoothness or roughness with which the lint is ginned, has come to be of minor importance as a grade factor, particularly since the development and nearly universal use of seed cotton driers at gins.

Color variations are of two types: Major variations between the classes of White, Spotted, Tinged, Yellow Stained, and Gray; and minor differences that occur between grades of any single color class, as between Middling White and Strict Low Middling White. These minor differences are chiefly in degree of lightness, the higher grades being lighter in color than the lower grades.

^{7/} U. S. Dept. Agr., The Classification of Cotton, Misc. Publ. No. 310, Rev. 1956.

Leaf and other trash vary in quantity through each of the grades, increasing from the high grades, in which there is little, to the lower grades, in which the proportion becomes comparatively large. The quantities of trash found in the White grades at the spinning laboratories of the U. S. Department of Agriculture are as follows:

Grade	:	Non-lint content
	:	(Shirley Analyzer)
	:	Percent
Good Middling.....	:	2.4
Strict Middling.....	:	2.9
Middling.....	:	3.7
Strict Low Middling.....	:	5.1
Low Middling.....	:	7.6
Strict Good Ordinary.....	:	11.0
Good Ordinary.....	:	17.0

Color and leaf in cotton are correlated, light color and low trash content being associated with high grade. Cottons which have the leaf or trash of one grade of White cotton and the color of the next higher grade are designated as "Plus" grades by the Department of Agriculture (generally described as "bright" by the cotton trade). "Middling Plus" is cotton which is Middling average or better in leaf and preparation with Strict Middling or better color. Cottons which have the leaf of one grade and color of a lower grade are designated as Light Gray or Gray. Middling Gray is Middling in leaf and preparation, but is more gray in color than Middling, and is no darker in color than Strict Good Ordinary. (For a fuller discussion of the grading of cotton, see USDA Miscellaneous Publication No. 310, The Classification of Cotton, from which much of the preceding discussion was derived).

The relation of color and leaf to grade has a direct bearing upon the advantages to the grower which may be expected to follow lint cleaning. A "plus" or "bright" bale may well be raised to the next higher grade step by the removal of trash, since the color of the bale would correspond to a higher grade, initially, than the trash content. On the other hand, a White bale on the dull side may be raised a grade for trash, but thrown into the Gray color class. Since prices for Gray cotton usually are equivalent roughly to White cotton two full steps lower in grade (Middling Gray brings about the same price as Low Middling White), the grower is almost sure to lose money if his cotton moves into the Gray class. Cottons remaining within the White class after lint cleaning are subject to the classer's evaluation of the relative importance of color and trash content.

Lint cleaning tends to distort the traditional relationship between color and trash content--as more and more trash is removed from the bale, the two grade factors become independent of each other. Therefore, it has increased

the problem of evaluating cotton in marketing channels. Some evidence suggests that classers may tend to pay more attention to color when classing the higher grades, and more to trash content when working with the lower grades. That tendency, if it exists, may be one explanation of the failure of lint cleaners to increase the price per pound of cottons Strict Low Middling or higher in grade before lint cleaning, even though 10 to 15 pounds of waste may be removed from the bale.

Cotton growers have enough information when their crops are harvested to decide how the cotton should be ginned. Early in the season and, in some areas, throughout the ginning period, when grades are high, lint cleaning probably will reduce bale values. On the other hand, if the lint is trashy but has good color, lint cleaning should increase returns to farmers. And in seasons like 1957-58, when high grades are scarce because of poor weather and premiums for grade are unusually large, lint cleaning all grades up through Strict Low Middling should be quite profitable.

One difficulty in applying even rough criteria such as those listed above is that every gin is apt to receive cotton varying widely in quality on any given day. When gins are running at full speed during the peak of the season, ginners cannot take time to vary their ginning procedure according to the trash content of seed cotton. That problem can be met by segregating the seed cotton, as it comes to the gin, into groups of similar qualities, and ginning each group in turn by the optimum gin setup. Seed cotton grouping has been advocated throughout the ginning industry, but it has not been widely adopted; most cotton growers cannot afford to wait all day for their cotton to be ginned nor can they afford to maintain enough trailers to leave one or more sitting in the gin yard. Despite the lack of enthusiasm with which seed cotton grouping has been received, however, it offers a real opportunity for increased returns to cotton growers.

Effects of Lint Cleaning on Fiber Properties

Lint cleaning is a relatively new development in the ginning field and its effects on cotton properties other than grade and staple length have not yet been assessed fully. Most studies to date have indicated that fiber and yarn properties are not changed by lint cleaning, except that trash content is reduced.

Some textile industry men maintain, however, that cleaning lint at the gin increases mill processing costs and lowers product quality. They state that excessive machining of cotton at the gin breaks fibers and decreases fiber length uniformity. Reductions in length uniformity, which may have little or no effect on commercial evaluations of fiber length, cannot be detected readily in marketing channels at present. Fiber irregularity increases the cost of moving cotton through a textile mill, however, and irregular cottons process into inferior qualities of yarns and fabrics. Two problems requiring immediate attention are (1) development of a quick and inexpensive

method for determining fiber length uniformity in marketing channels, and (2) some means of evaluating the effect of length uniformity on mill processing costs. Work is under way in both those areas.

Another complaint of the mills is that lint cleaners break up and redistribute the trash remaining in the cotton as small particles which are difficult or impossible to remove at the mill. They maintain also that because the smaller particles are less visible in the lint cotton than ordinary leaf and trash, the cotton may be assigned a higher value than its trash content would warrant.

In short, mill operators state that better quality yarns and fabrics can be spun at less expense from properly ginned cottons than from the same cottons passed through a lint cleaner, despite the higher grade of the lint cleaned cotton and the higher price it brings. Recent studies by the Agricultural Research Service ^{8/} lend some support to that position. The studies showed that for similar cottons, subjected to various degrees of seed cotton and single and tandem lint cleaning, cotton grades and yarn appearance grades were inversely correlated--the higher the grade of the raw cotton, the lower the grade of the yarn. Berkley ^{9/} arrived at similar conclusions about saw-type lint cleaners, although he reported that air-flow lint cleaners reduced spinnable waste at the mill and processed into higher grade yarns than samples of the same cotton taken ahead of the lint cleaners.

Both foreign and domestic buyers of our cotton have commented unfavorably on lint cleaned cotton. With the installation of double and triple tandem lint cleaners, these comments are increasing.

^{8/} Montgomery, R. A., and Nissing, T. J., The Cotton Gin and Oil Mill Press, Vol. 58, No. 5, March 9, 1957; and Griffen, A. C., McCaskill, O. L., Cotton Gin and Oil Mill Press, Vol. 58, No. 6, March 23, 1957.

^{9/} Berkley, Earl, Textile Research Journal, Vol. XXVII, No. 9, Sept..1957.

